# Improving Stream Habitat and Protecting Roads


Hoh 2 CED Construction, August 2014: Bank Stabilization Using Contiguous Log Revetment With Deflector Structures

# WSDOT CED Program Fiscal Years 2016 and 2017 Report

**Environmental Services Office**

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**Washington State Department of Transportation**
Environmental and Engineering Service Center
Environmental Services Office

**Improving Stream Habitat and Protecting Roads**
**WSDOT CED Program Fiscal Years 2016 and 2017 Report**

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## Abbreviations and Acronyms

CED – Chronic Environmental Deficiency

ER – Eastern Region

FY – Fiscal Year

NCR – North Central Region

NWR – Northwest Region

OR – Olympic Region

SCR – South Central Region

SRA – Site and Reach Assessment

SW – Southwest Region

WDFW – Washington State Department of Fish and Wildlife

WSDOT – Washington State Department of Transportation

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# Introduction

### *Annual Reports*

This report summarizes the Washington State Department of Transportation's (WSDOT) Chronic Environmental Deficiencies (CED) program accomplishments for Fiscal Year (FY) 2016 (July 2015 to June 2016) and FY 2017 (July 2016 to June 2017). We discuss active CED projects; other CED sites that are planned, analyzed, and funded for future construction; and nominated sites. For older projects, you may find more information in the reports from other years, available online at the link below, or by request. Also, of course, the staff are always happy to discuss the program with you (see contact information inside cover).

http://www.wsdot.wa.gov/Environment/Biology/FP/CEDretrofits.htm

### *The CED Program*

When roads are located along waterbodies they are often subject to periodic damage from seasonal high flows and severe storms. The traditional maintenance or emergency response is to protect the roadway with rock armoring to stabilize eroding banks and fend off the water's force. This work may only address a symptom and so require frequent repetition. Threats to the roadway and risk of road closures may continue.

The design of the historical road system often ignored ecological and fluvial processes. Today, new projects account for these processes. However, many of WSDOT's roads and bridges were built when these forces were poorly understood. Frequently, older projects require redesign to avoid chronic maintenance repairs that impact aquatic systems.

The traditional approach may also result in significant loss of aquatic habitat in the ongoing cycle of damage and repair. Severe weather, high flows and flooding exhibit increasing frequency and intensity in Washington State and elsewhere.

WSDOT, with the Washington Department of Fish and Wildlife (WDFW), established the CED program in 2001 to reduce the effect of repetitive maintenance activities on the aquatic environment and to find long-term solutions that optimize improvements for fish and fish habitat while addressing transportation needs.

The goal of the CED program is to:

- Reduce maintenance costs.
- Reduce societal impacts of road closures.
- Reduce or remove material that is or could be damaging to aquatic habitat.
- Protect infrastructure with rough woody structures and other bioengineered designs to enhance fish habitat.

A CED site is a location adjacent to the state highway system where recent, frequent, and chronic maintenance of the state transportation system is causing impacts to fish and fish habitat.

The CED program has set the following criteria for projects to be entered into the program. Adjustments may be made as projects get funded and constructed:

- Adverse habitat conditions related to fish or fish habitat are associated with repetitive repairs to WSDOT infrastructure.
- The infrastructure at the site has a history of maintenance actions, usually including at least three repairs and/or maintenance activities within the last 10 years.
- The project does not fit into another WSDOT funding category.

Often, to protect the road from damage due to river processes, bank stabilization is needed. The traditional response is to use rip rap armoring to stabilize the bank. However, this may result in damage to or loss of habitat. WSDOT is focusing on habitat-enhancing bank stabilization methods. Many different techniques may be applied on a site-specific basis. One of these techniques is engineered logjams (ELJs). ELJs have been constructed as both bank stabilization and as mid-channel flow diffusion structures (Hoh, Nooksack and Clallam Rivers). Mid-channel flow diffusion structures take the pressure of the flows off of the bank that is being damaged. Other projects in the CED program have replaced bridges to allow channel migration (Nolan Creek), or placed buried woody groins (Snoqualmie), which can be constructed out of the water and work to protect the bank from the rivers advance toward the highway.

The first Hoh River project, completed in FY 2006, is WSDOT's largest completed CED to date, and includes the world's largest known ELJs. WSDOT staff monitored the use of habitat in the Hoh River project and compared it with another failing site, a rip rapped bank just upstream. WSDOT is now looking at a small area of renewed erosion on the ten-year old site. The comparison site, known as Hoh 2, is also a CED site and was completed in FY 2016. There is a discussion of Hoh 2 in the Highlighted Projects section later in this report.

The Skagit River Engineered Log Jam project, completed in FY 2014, is another huge project that garnered much attention. Completed using a modular design with logs and concrete dolos, it is thought to be the largest use of dolos in fresh water in the world. This project was highlighted in the FY 2014 annual report, and some updates are included in the Highlighted Projects section of this report.

### *Initial Identification of CED Sites*

WSDOT and WDFW work together following a process specified in a Memorandum of Agreement established between WDFW and WSDOT (Washington State Department of Fish and Wildlife and Washington State Department of Transportation, 2008, updated 2016). Potential CEDs can be nominated by WSDOT, WDFW, Tribes or other concerned parties. Nominations come to the CED coordinator who works with WSDOT regional staff to identify possible CED projects. Nominations are screened to determine if the site meets the program's criteria with an initial site visit. The following people are involved in the initial site assessment and determine the eligibility:

- CED coordinator.
- CED technical lead.
- Region Maintenance Environmental Coordinator.
- Maintenance staff.
- Other persons familiar with the site.

***Site and Reach Assessment***

Reach assessment (Figure 1) is at the core of the CED project development process. A stream reach assessment (SRA) is conducted for each CED project site. These assessments can vary in scope and form. A corridor assessment addresses a larger scope and often analyzes multiple sites along the highway river interface. The SRA report gives a "best available science" approach to a solution. With input from WDFW, WSDOT identifies multiple alternatives and selects a recommended alternative.

The SRA addresses key habitat and road features and describes contributing factors related to landscape, land use, and infrastructure that led to the identified chronic deficiencies, and presents an evaluation of corrective treatment alternatives. The general approach used is similar to the Level 1 geomorphic assessment described in Hydraulic Engineering Circular (HEC) 20 3rd edition (Lagasse et al, 2012) as well as to the methods specified in in chapters 2-5 of the Integrated Streambank Protection Guidelines (WDFW 2002).

**Figure 1. Hydrologists in the field at Beaver Creek, SR 20, North Central Region.**

SRAs are primarily a tool for identifying the factors causing the problem and to develop conceptual solutions. It is neither a "cook-book" approach to solving CED problems, nor a substitute for design. It is anticipated that this approach will result in a project proposal that meets or exceeds applicable standards and other requirements for protecting public

safety, preserving transportation infrastructure, and will gain regulatory approval from resource agencies.

As SRAs are completed, they go through an internal WSDOT hydrology technical review, and are then reviewed by WSDOT region staff and area habitat biologists from WDFW. At the completion of WDFW review, which takes approximately a month, a meeting may be held to verify the intent of the recommended alternative and work out any technical concerns. Completed reach assessments for most CED sites are available from CED staff.

### *Concurrence Process*

At the conclusion of the SRA, a concurrence meeting may be held, either stand-alone or in combination with an early permit coordination meeting. Typically, in addition to CED staff, the attendees are an engineer and an area habitat biologist from WDFW; an engineer, a hydrologist, and a maintenance staff person from WSDOT; and other interested parties, especially from regulatory agencies. Here, the recommended alternative is discussed and WSDOT scoping engineers become familiar with the project. The concurrence meeting usually involves a presentation by the project's lead hydrologist, who describes the SRA and explains the recommended alternative. The CED coordinator facilitates the meeting and makes sure that experts on permitting, constructability, and feasibility are included as needed. Following the presentation attendees conduct a field review of the site to address constructability questions, environmental permitting, habitat features, and other feasibility questions. When the parties agree, a concurrence form is signed, and their conclusions are relayed to the scoping engineer to derive a cost estimate.

### *Prioritization*

In 2005, a prioritization methodology was created to provide a scientifically-based priority to the order of CED corrections (Sekulich, 2005). This prioritization allows WSDOT to submit a list of statewide prioritized projects to the Legislature. This process establishes a scientifically based priority index score (PI), allowing comparison with other proposed projects. The score is based on many factors related to amount of habitat protected, species present, transportation needs, and estimated cost ranges.

Multiple sites located along a highway corridor may be prioritized together using aggregated PI scores. This allows WSDOT to show cumulative benefits to addressing multiple projects in one area. This aggregate priority is established during the design phase, with major considerations being constructability and feasibility.

The prioritized and scoped projects are used as the basis to build a funding package and establish a request for project funds. WSDOT requests funding from the State Legislature on a project-specific, biennial basis. Funds from WSDOT's Highway Construction Improvement (I-4) Program are used to construct CED projects on state highways. Twenty-two projects have been completed with funding coming from the State Legislature within the CED program and in some cases from other sources including The Federal Highway Administration.

### *Funding*

CED projects are funded through several different sources. These can include dedicated stand-alone projects using project funds from WSDOT's Highway Construction Improvement Program (I-4), existing road project funds, emergency funds, and partnerships with Tribes, non-profits, counties, etc. If the CED project is not part of a larger project, the CED program staff orchestrates scoping the recommended alternative. Once scoped, a request for funding is put forward to the legislature under Improvement - Environmental Retrofit to address the deficiency as a standalone project.

By the end of FY 2017, 39 projects were completed, and seven are funded for design and/or construction (through CED or other funding program). A total of 154 sites (or groups of sites) have been nominated for CED analysis over the life of the program.

As mentioned above, some CED projects are funded under emergency situations. In these cases, collaboration with WDFW and the work that has been completed toward a site and reach assessment sets the stage to receive Federal funding. An SRA benefits WSDOT by outlining the problems, risks, and potential solutions at that site and in the project reach. This document can be used to support the justification for an emergency action and to protect habitat in the occurrence of an emergency or imminent threat. Also, the SRA is sometimes valuable in showing the need for a "betterment" using federal emergency funding.

WSDOT has many other stand-alone funding sources, some of which have requirements that are similar to those in the CED program. Funding for the Unstable Slopes Program is based on geotechnical issues such as slope stability. Funding for the Fish Passage Program is based in part on the ability for fish to navigate through WSDOT infrastructure. These programs are examples of other areas where projects may be funded if they do not meet CED criteria.

### *Design*

When the chosen alternative identified in the SRA is funded, the project is assigned to a project office. The CED coordinator coordinates with the project office to discuss the CED goals and objectives and make sure the project office has the support it needs. Often, the lead hydrologist for the SRA will be a member of the design team. WDFW is involved throughout the process with design review. Once the conceptual design is agreed on by resource agencies, appropriate permits are obtained.

### *Construction*

During construction the CED program staff verifies that the CED goals and design criteria are being met and provides technical assistance as needed.

## CED Projects

The CED program is a statewide program. Sites are identified by regional personnel and others. The CED coordinator and technical staff inventory the sites and enter them into the CED process. Once a project is funded, the project specifics go back to the region where it is fully designed and constructed.

Table 1 summarizes CED projects by their status and by WSDOT region, and Table 2 shows individual nominated CED projects and their status at the end of FY 2015. Table 3 explains the status codes. Status refers to current status at the end of the fiscal year. Figure 2 shows distribution of CED sites across the state.

**Table 1. Number of CED projects and status by WSDOT region, end of FY 2017.**

| Status | Eastern | No. Central | North-west | Olym-pic | So. Central | South-west | Total |
|---|---|---|---|---|---|---|---|
| **Nominated** | 1 | 3 | 9 | 9 | 6 | 4 | **32** |
| **Under Analysis** | 2 | 1 | 6 | 1 | 3 | 3 | **16** |
| **Assessed** | | 2 | 7 | 4 | 1 | 2 | **16** |
| **Monitor** | | | 1 | 2 | 1 | 3 | **7** |
| **Ongoing CED** | | 1 | 5 | 8 | 5 | 4 | **23** |
| **Concurred** | | | | | 1 | | **1** |
| **Scoped** | | 1 | 1 | 2 | | 2 | **6** |
| **Funded** | | | 3 | 2 | 2 | 1 | **8** |
| **Constructed** | 1 | 3 | 17 | 7 | 5 | 6 | **39** |
| **Re-opened** | | 1 | 2 | 1 | | 2 | **6** |
| **Total** | **4** | **12** | **51** | **36** | **24** | **27** | **154** |

**Table 2. List of CED projects, end of FY 2017.**

| Project | Status | Region | State Route | Milepost |
|---|---|---|---|---|
| SF Skykomish | Under Analysis | NWR | 2 | 39.50 |
| Skykomish River Gorman Property | Ongoing CED | NWR | 2 | 39.70 |
| Skykomish River | Under Analysis | NWR | 2 | 46.00 |
| Skinney Creek | Constructed | NCR | 2 | 88.00 |
| Chiwaukum Creek | Scoped | NCR | 2 | 89.96 |
| Wenatchee River (Tumwater Canyon) | Re-opened | NCR | 2 | 97.00 |
| Wenatchee River near Cashmere | Nominated | NCR | 2 | 116.30 |
| Chico Creek | Ongoing CED | OR | 3 | 40.95 |
| Campbell Creek | Nominated | SWR | 4 | 10.46 |
| Tributary to Red Salmon Creek (SB Lanes) | Queued for Analysis | SWR | 5 | 115.73 |
| Tilton River (site #2) | Under Analysis | SWR | 7 | 4.75 |
| MF Wildcat Creek | Funded | OR | 8 | 5.01 |
| Kennedy Creek | Ongoing CED | OR | 8 | 15.30 |
| Lower Dry Creek | Under Analysis | SCR | 10 | 104.26 |
| Vance Creek | Nominated | OR | 12 | 19.00 |
| Chehalis River | Nominated | OR | 12 | 27.71 |
| Moon Creek | Nominated | OR | 12 | 37.20 |
| Rainey Creek | Ongoing CED | SWR | 12 | 108.11 |
| EF Stiltner Creek | Ongoing CED | SWR | 12 | 109.30 |
| Cowlitz River | Constructed | SWR | 12 | 118.32 |
| Davis Creek | Ongoing CED | SWR | 12 | 121.00 |
| Naches River (410/12 Y) | Ongoing CED | SCR | 12 | 185.31 |
| Naches River (site #2) | Ongoing CED | SCR | 12 | 192.00 |
| Naches River (site #1) | Constructed | SCR | 12 | 201.30 |
| Pataha Creek | Nominated | SCR | 12 | 383.31 |
| Weeping Hillside | Nominated | SCR | 14 | 154.00 |
| McCormick Creek | Nominated | OR | 16 | 15.00 |
| Soosette Creek | Under Analysis | NWR | 18 | 8.90 |
| Snow Creek | Assessed | OR | 20 | 0.07 |
| Childs Creek | Ongoing CED | NWR | 20 | 72.80 |
| Red Cabin Creek | Constructed | NWR | 20 | 75.80 |
| Sutter Creek | Nominated | NWR | 20 | 99.90 |
| Skagit River | Constructed | NWR | 20 | 100.70 |

| Project | Status | Region | State Route | Milepost |
|---|---|---|---|---|
| Bacon Creek | Funded | NWR | 20 | 110.77 |
| Little Boulder | Assessed | NCR | 20 | 181.38 |
| Goat Creek Springs | Assessed | NCR | 20 | 184.34 |
| Beaver Creek | Under Analy-sis | NCR | 20 | 206.30 |
| Bonaparte Creek | Constructed | NCR | 20 | 278.00 |
| South Nanamkin Creek | Constructed | ER | 21 | 133.60 |
| San Poil River Corridor | Under Analy-sis | ER | 21 | 138.00 |
| Kettle River | Under Analy-sis | ER | 21 | 188.24 |
| Yakima River (Toppenish Bridge) | Assessed | SCR | 22 | 1.10 |
| Sand Hollow Wasteway | Constructed | NCR | 26 | 1.30 |
| Yakima River (site #4) @ Zillah | Queued for Analysis | SCR | 82 | 53.00 |
| EF Issaquah Creek 21.3 | Ongoing CED | NWR | 90 | 21.30 |
| EF Issaquah Creek 22.5 | Assessed | NWR | 90 | 22.50 |
| Snoqualmie River (Tinkham) | Monitor | SCR | 90 | 45.00 |
| Gold Creek | Constructed | SCR | 90 | 55.50 |
| Yakima River (Thorp to Irene Rinehart) | Ongoing CED | SCR | 90 | 105.00 |
| Wilson Creek | Nominated | SCR | 90 | 109.14 |
| Pilchuck River CED (Bess Prop) | Constructed | NWR | 92 | 5.00 |
| Carl Creek | Monitor | SWR | 97 | 17.20 |
| Satus Creek | Funded | SCR | 97 | 45.80 |
| Dry Creek | Nominated | SCR | 97 | 58.00 |
| Dry Creek Ellensburg | Constructed | SCR | 97 | 137.90 |
| Upper Dry Creek | Queued for Analysis | SCR | 97 | 143.50 |
| Peshastin Creek | Ongoing CED | NCR | 97 | 181.90 |
| Willapa River | Constructed | SWR | 101 | 54.50 |
| Milbourn Creek | Ongoing CED | OR | 101 | 130.00 |
| Dry Creek | Monitor | OR | 101 | 130.70 |
| Tributary to Boulder Creek | Under Analy-sis | OR | 101 | 133.50 |
| Nolan Creek | Constructed | OR | 101 | 170.50 |
| Hoh River (site #1) | Constructed | OR | 101 | 174.40 |
| Hoh 1 Follow-up | Re-opened | OR | 101 | 174.40 |
| Old Joe Slough | Scoped | OR | 101 | 174.61 |
| Hoh River (site #2) | Constructed | OR | 101 | 175.80 |

| Project | Status | Region | State Route | Milepost |
|---|---|---|---|---|
| US 101 McDonald Creek | Constructed | OR | 101 | 258.21 |
| Matriotti Creek | Funded | OR | 101 | 260.93 |
| Contractors Creek | Ongoing CED | OR | 101 | 278.00 |
| Dosewallips River | Assessed | OR | 101 | 306.60 |
| Beach Nourishment MP 320-333 | Ongoing CED | OR | 101 | 320.00 |
| Sund Creek | Ongoing CED | OR | 101 | 329.08 |
| Miller Creek | Ongoing CED | OR | 101 | 329.93 |
| Norris Slough | Constructed | SWR | 105 | 16.55 |
| Washaway Beach | Re-opened | SWR | 105 | 20.10 |
| SR 106 Washouts 1 to 5 | Constructed | OR | 106 | 10.00 |
| Twanoh Creek | Ongoing CED | OR | 106 | 12.30 |
| Twanoh Falls Creek | Constructed | OR | 106 | 13.50 |
| Slide Creek | Monitor | OR | 108 | 6.00 |
| McDonald Creek | Nominated | OR | 108 | 8.90 |
| Moclips River | Assessed | OR | 109 | 31.50 |
| Strait of Juan de Fuca | Nominated | OR | 112 | 5.00 |
| Clallam River | Constructed | OR | 112 | 19.60 |
| Pysht River | Nominated | OR | 112 | 24.60 |
| Klickitat (Lower Bank Site) | Monitor | SWR | 142 | 7.00 |
| Skookum Canyon Creek | Scoped | SWR | 142 | 14.80 |
| Wahkiakus Bridge | Scoped | SWR | 142 | 16.33 |
| Klickitat River at SR 142, MP 14.8 – 19.0 | Assessed | SWR | 142 | 16.90 |
| Little Klickitat Confluence | Assessed | SWR | 142 | 19.00 |
| Methow River | Nominated | NCR | 153 | 4.59 |
| Little Bear Creek Bridge | Funded | NWR | 202 | 0.14 |
| Snoqualmie River, Preston-Falls City | Constructed | NWR | 202 | 21.80 |
| Mud Creek | Monitor | NWR | 202 | 23.50 |
| Snoqualmie River Sinnema-Quaale Site | Under Analysis | NWR | 203 | 11.05 |
| Coe Clemmons Creek | Constructed | NWR | 203 | 14.55 |
| Peoples Creek | Nominated | NWR | 203 | 19.52 |
| Nason Creek | Nominated | NCR | 207 | 0.50 |
| Yakima River (Van Giesen Road) | Constructed | SCR | 224 | 7.90 |
| Spring Creek | Nominated | ER | 231 | 37.00 |
| Union River Bridge | Assessed | OR | 300 | 2.00 |
| Sand Hill Road | Scoped | OR | 300 | 2.00 |
| Victor Flood Issue | Nominated | OR | 302 | 4.18 |
| Dogfish Creek | Nominated | OR | 307 | 0.05 |

| Project | Status | Region | State Route | Milepost |
|---|---|---|---|---|
| Forbes Creek | Under Analysis | NWR | 405 | 19.12 |
| Clay Creek | Assessed | NWR | 410 | 35.76 |
| Old Hancock Bridge (AKA Twin Creeks) | Assessed | NWR | 410 | 38.00 |
| White River (Federation Forest) | Assessed | NWR | 410 | 41.40 |
| White River (Skookum Falls Viewpoint) | Assessed | NWR | 410 | 51.60 |
| White River (High Bank) | Re-opened | NWR | 410 | 54.90 |
| Miner Creek | Nominated | SCR | 410 | 81.60 |
| American River (Hells Crossing) | Concurred | SCR | 410 | 83.50 |
| American River (Hells Crossing site #2) | Ongoing CED | SCR | 410 | 84.00 |
| Parker Creek | Nominated | SCR | 410 | 88.40 |
| Rock Creek | Ongoing CED | SCR | 410 | 102.30 |
| Rattlesnake Creek | Constructed | SCR | 410 | 107.50 |
| Chelatchie Creek Tributary | Nominated | SWR | 503 | 24.65 |
| Marble Creek | Nominated | SWR | 503 | 42.93 |
| Houghton Creek | Ongoing CED | SWR | 503 | 47.80 |
| Kenyon Creek | Nominated | SWR | 503 | 49.03 |
| Toutle River | Constructed | SWR | 504 | 16.00 |
| Wooster Creek | Funded | SWR | 504 | 17.00 |
| Newaukum River (site #3) (Guerrier Rd) | Constructed | SWR | 508 | 3.15 |
| Newaukum River (site #2) | Re-opened | SWR | 508 | 5.80 |
| Newaukum River (site #1) | Constructed | SWR | 508 | 7.00 |
| No Name Creek (Tilton Trib) | Monitor | SWR | 508 | 24.30 |
| Tilton River (site #1) @ Morton | Under Analysis | SWR | 508 | 29.00 |
| Union and Steamboat Sloughs | Assessed | NWR | 529 | 5.35 |
| Stillaguamish | Under Analysis | NWR | 530 | 21.81 |
| Sauk River (confluence) | Constructed | NWR | 530 | 56.00 |
| Sauk River Confluence Follow-up | Re-opened | NWR | 530 | 56.00 |
| Sauk River (cribwall) | Constructed | NWR | 530 | 58.45 |
| Sauk River (realignment) | Constructed | NWR | 530 | 59.20 |
| Skagit River Bridge | Ongoing CED | NWR | 530 | 67.34 |

| Project | Status | Region | State Route | Milepost |
|---|---|---|---|---|
| Anderson Creek | Constructed | NWR | 542 | 6.50 |
| NF Nooksack River, re-vetment | Constructed | NWR | 542 | 20.50 |
| NF Nooksack River, washout | Constructed | NWR | 542 | 26.70 |
| NF Nooksack River, Devine Property | Nominated | NWR | 542 | 27.00 |
| NF Nooksack River (Site No. 3) | Assessed | NWR | 542 | 27.06 |
| NF Nooksack River (Site No. 4) Berry Stand | Nominated | NWR | 542 | 27.17 |
| NF Nooksack River, Bruces Creek | Constructed | NWR | 542 | 28.00 |
| NF Nooksack River (Site No. 6) Boulder Creek Bridge | Constructed | NWR | 542 | 28.34 |
| NF Nooksack River, Warnick Bluff | Constructed | NWR | 542 | 30.00 |
| NF Nooksack River (Site No. 12) Cornell Creek Road | Nominated | NWR | 542 | 30.50 |
| NF Nooksack River (Site No. 10) Warnick Bridge | Ongoing CED | NWR | 542 | 30.87 |
| NF Nooksack River (Site No. 9) Canyon Creek Levee | Nominated | NWR | 542 | 30.89 |
| NF Nooksack River (Site No. 7) Gallup Bridge | Constructed | NWR | 542 | 33.41 |
| NF Nooksack River (Site No. 8) Glacier Creek Bridge | Scoped | NWR | 542 | 33.50 |
| NF Nooksack R (Site No. 8a) Glacier Cr Side Chan-nel | Funded | NWR | 542 | 33.60 |
| NF Nooksack River, pow-erline | Constructed | NWR | 542 | 37.20 |
| NF Nooksack River, upper powerline | Nominated | NWR | 542 | 37.68 |
| NF Nooksack River, Church Mt. Rd | Constructed | NWR | 542 | 38.00 |
| NF Nooksack River (Site No. 15) Fossil Creek Bridge | Nominated | NWR | 542 | 38.50 |

| Project | Status | Region | State Route | Milepost |
|---|---|---|---|---|
| NF Nooksack River (Site No. 17) | Nominated | NWR | 542 | 41.90 |
| Teanaway River | Funded | SCR | 970 | 5.50 |

**Table 3. CED Status Code explanations.**

| Status | Description |
|---|---|
| Nominated | Nominated for inclusion in the CED Program, no substantive analysis completed. Analysis will happen as staff and internal priority allows. |
| Under Analysis | Ongoing analysis to result in Reach Assessment or similar document. |
| Assessed | Reach assessment completed but no project proposed. |
| Monitor | Reach assessment completed but no project is proposed; site will be watched. |
| Ongoing CED | Project or projects proposed, site in flux and/or working toward concurrence. |
| Concurred | WSDOT and WDFW have reached concurrence. |
| Scoped | Project has been scoped. |
| Funded | Funding has been identified (from CED funding or other source) but project is not yet under construction. |
| Constructed | Constructed |
| Re-opened | Site or project conditions have changed; new analysis is underway. |

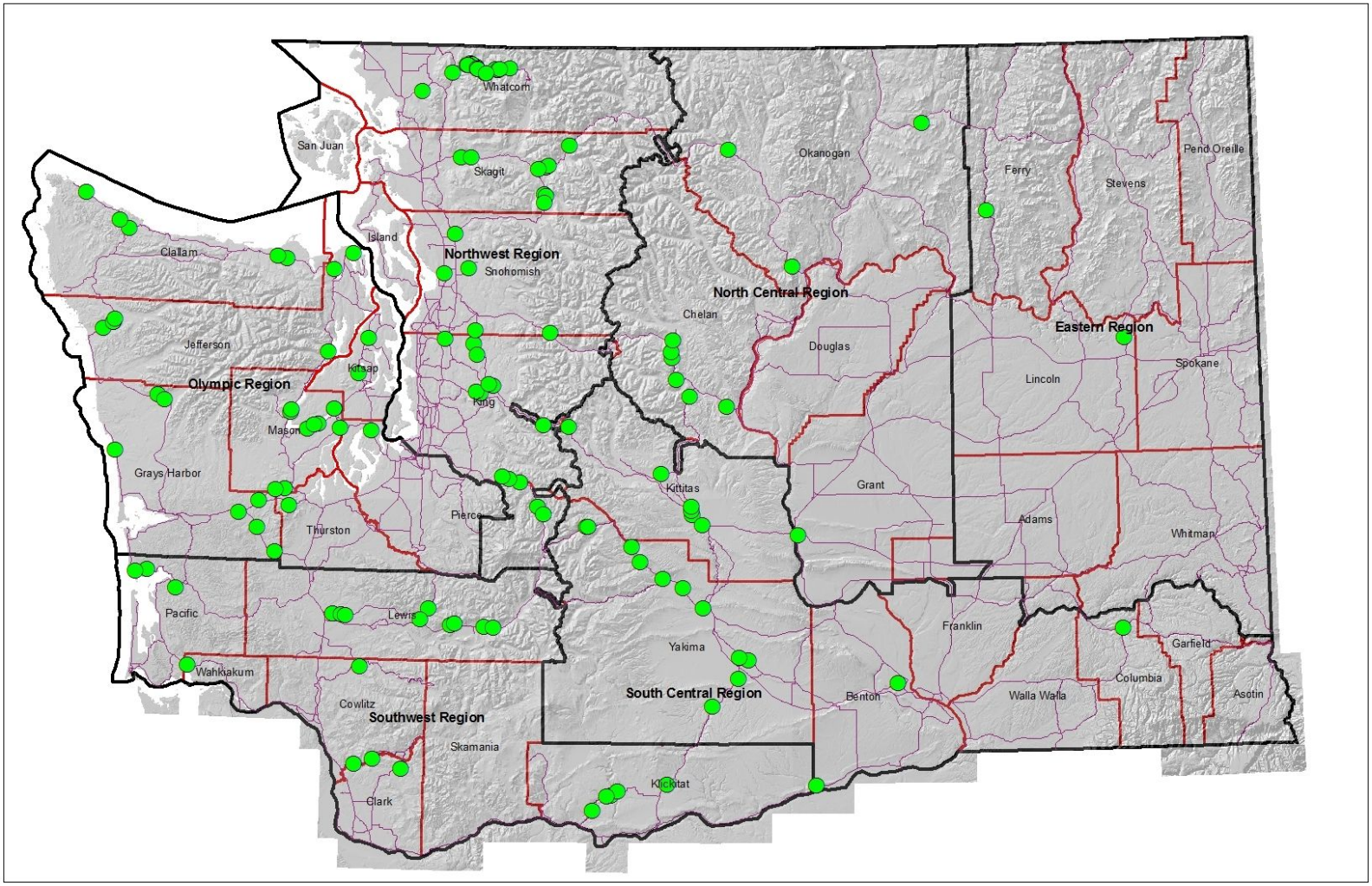


**Figure 2. Statewide distribution of CED projects and WSDOT Regions.**

## FY 2016 and 2017 Activities

### *New Sites*

New locations have been added to the list of CED-nominated sites during these fiscal years. These include:

- SR 2, MP 39.5, South Fork Skykomish River, Northwest Region. The river is rapidly eroding a steep highway embankment.
- SR 5, MP 115.73, , Red Salmon Creek, Olympic Region. A culvert is inundated and blocked by debris and braver activity.
- SR 20, MP 206.3, Beaver Creek, North Central Region. Erosion from creek threatening highway and private bridge.
- SR 21, MP 117 to 159, San Poil River, Eastern Region. Corridor-style analysis of multiple site (four major) where erosion is threatening roadway or bridges.
- SR21, MP 188.24, Kettle River, Eastern Region. The river is eroding a long stretch of highway embankment. One or more other sites in the vicinity will be investigated during the SRA.
- US101 MP 133.5, Tributary to Boulder Creek, Olympic Region. Frequent maintenance of possibly undersized culvert.
- SR 410, MP 81.6, Miner Creek, South Central Region. Culvert overwhelmed by sediment, stream avulsion.
- SR 410, MP 82.4, Parker Creek, South Central Region. Culvert overwhelmed by sediment, stream avulsion.

### *Concurrence*

No new project concurrences were agreed to this period, but several were updated to reflect new construction plans, including Sauk River Confluence (SR 530) and Wooster Creek (SR 504).

### *Construction*

Seven CED projects were constructed during the two-year period. The completed projects were:

- The “Hoh 2” project (SR101 MP 175.8) was completed in the summer of 2014. This project built a log cribwall reinforced with steel pilings. An innovative system of gravel-filled sacks isolated the worksite without need for sheet-piles or other more invasive means of diverting flow. For more information, see the section on this project in “Highlighted Projects,” below.
- The Cowlitz River project, SR 12 MP 118.3 was designed and built quickly when it became apparent that SR 12 was in imminent danger. For more information, see the section on this project in “Highlighted Projects,” below.
- The Warnick Bluff project is located at a spot where SR 542 runs along the top of an unconsolidated 80-foot cliff (see Figure 3). A realignment of a section of highway moved the road about 200 feet back from the edge of the bluff. While this is not necessarily a permanent fix, the relatively slow retreat of the bluff should allow this to function as a relatively long-term fix (see Figure 4).

- The SR 203 (MP 6.5) Coe-Clemons Creek CED project was completed in October, 2015. This project replaced an undersized culvert that was unable to pass flood flows and debris and sediment produced by abunant mass-wasting upstream. The new structure enables the passage of large amounts of debris and sediment downstream under SR 203, allows for natural geomorphic change over time, and removes the risk of a catastrophic road failure.
- SR 542 (MP 6.5) Anderson Creek project was was completed in the Sumer of 2015. This project replaced an undersized, perched double box culvert, an existing fish ladder that was no longer functioning correctly, and a causeway with a new single-span bridge and grade control structures. For more information, see the section on this project in "Highlighted Projects," below.
- The Toutle River project (SR505 MP 16) provided geotechnical stabilization of the upper slope, and installation of habitat elements upstream and downstream of an emergency repair, to improve habitat conditions and smooth the transition to the emergency armor.
- The SR 92/Pilchuck River CED was completed in September, 2016. This project constructed a roughened rock revetment to protect an eroding bank that was rapidly approaching the highway. A house that had been located between the river and the highway had been lost to the river already, and the CED project should protect the road from being the river's next victim.

**Figure 3. Warnick Bluff before road relocation.**

**Figure 4. Warnick Bluff, showing replanted area where road was before relocation. The new road is located well to the right of this photo.**

## Highlighted Projects

***SR 20, MP 100.7, Skagit River.***

The **Skagit River (SR 20 MP 100.7) dolo-timber project was a major accomplishment in FY 2014**. For details, see the FY 2014 Annual Report.

Since completion, the project has continued to get attention from the press and the travelling public Through the summer tourist season, there was almost always someone stopped to check it out. The project seems to be working as planned, although at least one of the hundreds of dolos has shifted position. Maintenance staff will determine the best way to address the misplaced dolo (see Figure 5).

**Figure 5. Air photo of part of the Skagit River dolo-timber project showing dolo that has moved (near center of picture, off the point).**

***SR 101, MP 175.8, Hoh River Site 2.***

The **Hoh River Site 2 project** was completed in the summer of 2014. This site, a major erosion site along a high-energy reach of the Hoh River and is only a mile from the well-known Hoh 1 site. Erosion on a bend in the Hoh River had caused numerous incidents of maintenance and a project was developed to address the problem with a log cribwall between the road and the river (see Figures 6 and 7 and this document's cover). The construction went very smoothly. An innovative system of gravel-filled sacks was used to isolate the worksite (without need for sheet-piles or other more invasive means of diverting flow) and was combined with a temporary access structure so that the project could be built without placing equipment in the river. The completed project seems to be working exactly as planned, and has already been subjected to some high flows without complications.


**Figure 6. Hoh 2 project under construction showing isolation structure and temporary access structure.**

**Figure 7. Completed Hoh 2 project.**

***SR 12, MP 118, Cowlitz River.***

The **Cowlitz River** site continued to erode rapidly toward the highway (see Figure 8) even in relatively minor periods of high water. The top of the eroded bank reached the right-of-way fence by spring of 2015 and an accelerated design and construction effort allowed WSDOT to complete the project in the summer of 2015. The project was a simple rock revetment with a series of log structures to provide habitat and structural reinforcement (see Figure 9). Behind the structure there are flood fences and riparian plantings.

Water levels in two closely-spaced storms in the fall of 2015 overtopped the structure (water reached the highway surface) and did minor damage to parts of it. Considering the incredible rate of erosion that had occurred in recent years with much smaller storms, it seems likely that there would have been major damage to the road without the new protection offered by the rock and wood structure. The damage was not enough to threaten the road, and maintenance staff were able to postpone repairs to be done in the summer low-water season.

**Figure 8. Cowlitz River Site, US 12, 2014 (left) and 2015 (right). About 20 feet has eroded and the river had reached the right-of-way fence.**

**Figure 9. Cowlitz River Site, US 12, detail of completed project, October 2015.**

***SR 542, MP 6.5, Anderson Creek.***

The SR 542 **Anderson Creek** project was a big accomplishment during this period, being completed in October, 2015. Anderson Creek flows under SR 542. Before this project, it went through twin eight-foot box culverts. The deep causeway under the road trapped sediment and debris and caused downstream incision. The stream had incised to a depth of about 11 feet at the downstream end of the culvert preventing fish passage. A fish ladder was in place due to the scouring at the bottom of the culvert and required frequent maintenance. The culverts and the fish ladder had become functionally inadequate. During a flood event in January of 2009 the left opening of the culvert and part of the right opening were clogged, impounding water behind the then-existing embankment and forming a temporary lake. The project replaced the culverts with a bridge. The stream profile was regraded to make it fish-passable. Connectivity in the flood plain has been reestablished, and a reliable bridge is in place.

**Figure 10. Anderson Creek culverts (hidden under blackberry bushes) and 11-foor waterfall caused by incision, October 2009.**

**Figure 11. Anderson Creek bridge nearing completion, photo from approximately the same spot as Figure 10, October 2015.**

## References

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